Test of Biodegradable Alternatives to Plastics Used in Living Shoreline Stabilization in Mosquito Lagoon

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Introduction

- Living shoreline projects in Florida have relied on oyster materials constructed with plastic mesh to create wave breaks and promote oyster recruitment (photo below).
- Microplastic research has highlighted the need to reduce plastic inputs into estuaries and multiple biodegradable materials were developed for use in living shorelines.
- Direct comparisons of different materials are needed to guide decision-making by restoration practitioners.

Living shoreline stabilization at the Canaveral National Seashore Visitor Center using plastic mesh shell bags 1-year after deployment.

Study Objective

To compare stability and oyster recruitment of 5 biodegradable materials to plastic shell bags at a living shoreline in Mosquito Lagoon

Methods

- In June 2020, we deployed 5 biodegradable materials as part of the on-going stabilization.
- All materials were deployed on 50 m of shoreline in 6 m long units, with 4 m gaps between materials (1 shoreline unit/material).
- Movement & damage monitored after 1 wk + monthly.
- All visible live oysters counted & measured in 5 random quadrats (0.25 m^2) in each 6 m shoreline unit in January 2021.

Materials

Metal Gabions
- 10 gabions in 1 row
  - Size: 0.5m x 0.3m x 0.1m

BESE™ Potato Starch Gabions
- 2 gabions
  - Size: 0.5m x 0.5m x 0.5 m

CORE modules by UF Whitney Lab
- 20 cores in 2 rows
  - Size: 0.3m x 0.1m x 0.1m

Concrete & Jute by Sandbar Oyster Company
- 13 tables in 2 rows
  - Size: 0.5m x 0.5m
  - Legs buried until table ~0.25 m above sediment

Concrete Blocks
- 20 blocks in 2 rows
  - Size: 0.3m x 0.1m x 0.1m

Preliminary Results: 6-months Post-Deployment

Movement and Damage (# units)

Material Tested	Movement	Damage
Metal Gabions	3	1
BESE™ Potato Starch Gabions	0	2
CORE modules	5	4
Concrete & Jute	0	0
Concrete Blocks	8	0
Plastic Shell Bags	0	0

Oyster Density and Size

Material Tested	Mean Oyster Density ± SE (# live oysters/0.25 m^2)	Mean Oyster Shell Height ± SE (mm)
Metal Gabions	2.2 ± 0.6	15.2 ± 2.1
BESE™ Potato Starch Gabions	NA	NA
CORE modules	1.1 ± 0.3	15.0 ± 0.1
Concrete & Jute	12.7 ± 2.7	15.5 ± 0.8
Concrete Blocks	3.9 ± 0.8	19.3 ± 2.6
Plastic Shell Bags	3.4 ± 1.1	16.7 ± 2.1

Preliminary Conclusions

- All structures remained after 6 months, with exception of BESE™ gabions (collapsed after first week).
- Increased movement of COREs, blocks, and gabions may have been caused by large shell on shoreline preventing settling into sediment after deployment.
- Maximizing surface area (concrete and jute tables) and protected surfaces (concrete blocks) led to the highest oyster densities and shell heights, respectively.

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